Amendments to the Specification

Please replace the paragraphs at page 7, line 19 to page 10, line 17 with the following amended paragraphs:

Fig. 1 shows a cross-section of a simple structure 100 with patterned surface layers 102 on a silicon substrate 104. The surface layers 102 are patterned such that an area of open silicon 106 is exposed. This would be the state at the end of a mainstream silicon process, for example a CMOS process. The silicon would still be in the form of a silicon wafer (not yet diced), at this point in the process. Bonding pads (not shown) at the periphery of the chip, could also be exposed at this stage of the process.

Fig. 2 shows the same simple structure 100 after etching of a cavity 108 underneath a portion of the patterned surface layers 102. The patterned surface layers 102 suspended over the cavity 108 constitute the "suspended micro-structure" 110. Intricacies of the process of etching the cavity are known to a person skilled in the art.

Fig. 3 shows the same structure after application of a protective layer 112. The protective layer 112 must be applied in a sufficient thickness that it can accommodate a cavity 108 of sufficient thickness for the function of the device which involves the micro-structure. (This cavity could have vertical dimensions in the range of a few microns to tens of microns or more.) In Fig. 3 the protective layer 112 fills the entire cavity 108, including directly beneath the suspended microstructure 110. Next, the substrate can be singulated into dice (chips), and electrical contacts to the chip can be realized. This realization can be accomplished by bonding of wires to exposed bonding pads, which would need to have been exposed by patterning the protective layer, likely before dicing.

Fig. 4 shows the same structure 100, (now intended to represent a micro-structure on a single chip instead of on a wafer full of such structures), where the cavity 108 has been created within the protective layer 112. The cavity 108 has been created by heating from a heat source on the micro-structure 110 itself. The heating has caused the creation of a bubble 114 within the bulk of the protective layer 112, both above and below the micro-structure 110. The heating may have been accomplished by passing an electric current (via the electrical contacts) through an electrically resistive element situated within the suspended micro-structure 110. The dissipation

of electric power in the resistive element could raise the temperature of the micro-structure 110 high enough that it melts or burns or, in general causes a phase change, the adjacent protective material 112 to create the cavity 108.

In the case where the entire micro-cavity 108 is filled with the protective material 112, as seen in figure 3, the protective material must be capable of shrinking away from the micro-structure 110 when subjected to the heat generated from the micro-structure 110. This shrinking preferably occurs as a result of the material 112 being porous and the burned portions of the material 112 dissipating within adjacent voids in the unburned portion of the material. Alternatively, the shrinking can occur as a result of a restructuring of the molecules making up the material 112. When the material 112 is subjected to heat, the restructuring causes the material 112 to retract into a smaller volume.

Several variations of material deposition and cavity geometry are possible. For example, Fig. 5 shows the case where the protective layer 112 applied does not completely fill the cavity 108 underneath the micro-structure 110. This case could occur, for example, if the protective layer 112 were deposited as a liquid with a high surface tension or high viscosity, and if the opening 116 to the cavity 108 underneath the micro-structure 110 were too small for rapid flow of the liquid. In this case, the heating could enhance the cavity 108 by extending it above the micro-structure 110, again creating an appropriate cavity 108 for functional operation of the micro-structure 110, as shown in Fig. 6.

In cases where the micro-cavity 108 is not filled by the protective material 112, as can be seen in figure 5, the material 112 may undergo a phase change and turn into gas, thereby deforming the rest of the material 112 as a result of the gas pressure. If the gas pressure is strong enough and the packaging cannot withstand the added stress, the entire packaging may become deformed as a result of the phase change. If the packaging can withstand the tension due to the gas pressure, no visible change to the packaging will occur and only the material 112 within the packaging will be deformed. This type of reaction may also occur when the micro-cavity 108 is filled by the protective material 112, as seen in figure 3.

In the case where a vacuum is formed within the unobstructed volume, the material 112 may undergo a change that will cause it to solidify and remain solid during subsequent operation of the chip. Alternatively, the material 112 may be softened subsequently as a result of further heating due to standard operation of the device, thereby causing the material to collapse back

down onto or near to the micro-structure 110. Further heating of the micro-structure 110 may then recreate the unobstructed volume 114 above and below the micro-structure.

Fig. 7 shows a schematic of a chip 120, in a typical packaged and bonded configuration, prior to creation of the cavity 108. The cavity 108 can then be created within the protective material 112 by applying electrical signals through the bonding wires 122.

Fig. 8 shows how such a chip 120 with protected microstructures 110 could be embedded within an injection-molded plastic package 124. The bonding wires 122 extend through the plastic 124 to make contact with external electric circuitry.

An example of material for the protective layer 112 is polymer materials, which can often be applied or deposited as a liquid and readily baked until it becomes suitably solid. Also, such materials are largely composed of the elements carbon, oxygen, and hydrogen, suitable for creation of the cavity 108 by burning (due to the heat).

A further example of material for the protective layer 112 is photosensitive material such as photoresist, where it could simultaneously perform addition function(s) in the processing of the device, such as for patterning of flip-chip nubs. This configuration is shown in Fig. 9, where the material 112 protecting the micro-structures 110 is the same photo-sensitive material that was used to pattern the nubs. As in Fig. 7, the device shown in Fig. 9 is ready for creation of the cavity 108 by applying electrical power signals.

A further requirement on the protective material 112 is as follows. If it is applied as a liquid (or liquid with a high surface tension) prior to solidification, it must not shrink or expand during solidification such that it damages the micro-structure 110.